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Phase-space representation of completely positive quantum operation: Invertible subdynamics of two-mode squeezed states

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Abstract

© 2015 American Physical Society. Completely positive quantum operations are frequently discussed in the contexts of statistical mechanics and quantum information. They are customarily given by maps forming positive operator-values measures. To intuitively understand the physical meanings of such abstract operations, the method of phase-space representations is examined. This method enables one to grasp the operations in terms of the classical statistical notions. As an example of physical importance, here, the phase-space representation of the completely positive quantum operation arising from the single-mode subdynamics of the two-mode squeezed vacuum state, which maps from the vacuum state at vanishing temperature to mixed states with perfect decoherence including the thermal state, is studied. It is found in the P representation that remarkably this operation is invertible, implying that coherence lost by the quantum operation can be recovered.

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